Urban Water Management Plan

2005 Update

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

2050 Study	2050 Napa Valley Water Resources Study
AB	Assembly Bill
ABAG	Association of Bay Area Governments
Act	Urban Water Management Planning Act
AF	Acre-Feet
BMPs	Best Management Practices
CALFED	California-Federal Bay-Delta Program
CII	Commercial, Industrial, and Institutional
CIMIS	California Irrigation Management Information System
CUWCC	California Urban Water Conservation Council
CVWD	Congress Valley Water District
DHS	California State Department of Health Services
DMMs	Demand Management Measures
DSOD	California State Division of Safety of Dams
DWR	California State Department of Water Resources
EECNC	Environmental Education Coalition of Napa County
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ETo	Reference Evapotranspiration
gpcd	Gallons per capita per day
IRWMP	Integrated Regional Water Management Plan
KCWA	Kern County Water Agency
LAFCO	Local Agency Formation Commission of Napa County
Master Plan	City of Napa Water System Optimization and Master Plan
MG	Million gallons
MGD	Million gallons per day
MOU	Memorandum of Understanding
NCFCWCD	Napa County Flood Control & Water Conservation District
NBA	North Bay Aqueduct
NSD	Napa Sanitation District
NVUSD	Napa Valley Unified School District
RUL	Rural Urban Limit
SB	Senate Bill
SEMS	Standardized Emergency Management System
SWP	State Water Project
SWRCB	State Water Resources Control Board
ULFT	Ultra-Low-Flush Toilet
UWMP	Urban Water Management Plan
WATRTAC	Water Resources Technical Advisory Committee
WRF	Water Recycling Facility
WTP	Water Treatment Plant

REFERENCES

Association of Bay Area Governments, *Projections 2003: Forecasts for the San Francisco Bay Area to the Year 2030*

California Department of Water Resources, *Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan*, January 18, 2005

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Larry Walker Associates, *Napa Sanitation District Strategic Plan for Recycled Water Use in the Year 2020*, Final Draft, August 2005

Local Agency Formation Commission (LAFCO) of Napa County, *Comprehensive Water Service Study*, 2003

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West Yost & Associates, *City of Napa Water System Optimization and Master Plan*, Volume II – Master Plan Report, Adopted November 18, 1997

CHAPTER 1

INTRODUCTION

1.1 Purpose of Urban Water Management Plan

In 1983, the Urban Water Management Planning Act (Act) was adopted by the California State Legislature as Assembly Bill (AB) 797. Signed into law by Governor Deukmejian in 1984 and amended several times since then, the Act is contained in California Water Code Division 6, Part 2.6, Sections 10610 through 10657. The Act requires all urban water suppliers serving more than 3,000 customers or supplying more than 3,000 acre-feet (AF) annually to develop an Urban Water Management Plan (UWMP). The required contents of the UWMP are set forth in the Act. An UWMP describes and evaluates sources of water supply, projected population and future water demand, demand management measures, strategies for responding to water shortages, and other relevant information and programs.

Under the Act, urban water suppliers are required to update their UWMP and submit a complete plan to the State Department of Water Resources (DWR) every five years. With its water system size well above the thresholds in the Act, the City of Napa has complied with the UWMP provisions since the Act's inception, submitting its most recent UWMP update to DWR in 2000. The City has adapted its UWMP over the years to meet various amendments to the Act. A recycled water component was added as a result of AB 2853, passed in 1994. AB 1845, passed in 1995, focused the City's efforts to ensure the appropriate level of reliability in its water service to meet the needs of its customers during normal, dry, and multiple-dry water years. More recent emphasis on demand management measures has coincided with the City's membership in the California Urban Water Council (CUWCC) and its 2002 signing of the Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California.

The purpose of the City's UWMP update is not simply to comply with State law and help ensure the efficient use of California water resources. The UWMP benefits the City directly by supporting future updates to the City's General Plan and facilitating the implementation of two other State water planning laws, Senate Bill (SB) 610 and SB 221, that address the impact of large developments on water supply. Also, by submitting a complete UWMP, the City remains eligible for DWR-administered grants and loans as well as drought assistance. Supply and demand data from the City's UWMP 2005 will also become part of a Bay Area Integrated Regional Water Management Plan (IRWMP). The IRWMP recognizes the need for more coordination and mutual support in water planning for the overall Bay Area. It is to be completed in 2006 using Proposition 50 Chapter 8 grant funds.

1.2 UWMP Development and Agency Coordination

The Water Division of the Public Works Department took the lead in preparing this City of Napa UWMP 2005 update, but coordination with other City staff was necessary. Planning staff in the Community Development Department were consulted on population projections. The City Attorney and City Clerk were consulted regarding legal and public hearing/UWMP adoption issues. Existing City water planning documents were also consulted, especially the City of

Napa Water System Optimization and Master Plan adopted in 1997 (Master Plan), and of course the UWMP 2000 update.

Coordination with other local agencies occurred largely as a result of the City's participation in the 2050 Napa Valley Water Resources Study (2050 Study). The 2050 Study was conducted by West Yost & Associates from 2003 to 2005 at the direction of five Cities, the County of Napa, and the Napa Sanitation District (NSD), the local wastewater treatment agency. The participating agencies recognized the urgent need to update the previous Napa Valley regional water study completed in 1991, and a desire to take a long-term view in evaluating supply, demand, and potential projects. The final report of the 2050 Study was accepted by the Board of the Napa County Flood Control & Water Conservation District (NCFCWD) on November 15, 2005. Development of the UWMP 2005 update benefitted from this concurrent regional study as the same City of Napa water supply, demand, and reliability data are incorporated in both documents.

The other key forum in which Napa-area water issues are discussed is the monthly meeting of the Water Resources Technical Advisory Committee (WATRTAC), a group consisting of Public Works Directors and Water Managers from the Cities of Napa, American Canyon, St. Helena, and Calistoga, the Town of Yountville, and the County of Napa (NCFCWD). Throughout 2005, WATRTAC members were made aware that the City of Napa was preparing its UWMP update. Having recently passed the system size thresholds in the Act, the City of American Canyon was also preparing its very first UWMP. The City of Napa discussed UWMP issues with American Canyon officials and their consulting firm, particularly in the area of supply reliability.

The City has a water relationship with each of these local agencies. The NCFCWD is the State Water Project (SWP) contractor through which the City receives its annual SWP entitlement. While not a wholesale agency, the City of Napa does treat and wheel the City of Calistoga's and the Town of Yountville's SWP contract water and also provides supplemental water to the Cities of American Canyon and St. Helena during emergencies. The City has an agreement with NSD regarding the sale of recycled water to customers in the City's water service area. NSD also spearheaded the Napa-Berryessa Regional Water Management Group's application for Proposition 50 Chapter 8 grants to help fund recycled water and other projects addressing Napa County water reliability. The City consulted a newly drafted NSD Strategic Plan to support the recycled water components of this UWMP.

UWMP 2005 coordination with local agencies is summarized in Table 1-1. Relevant correspondence is included in Appendix A.

Table 1-1
Agency Coordination Checklist

	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt
County of Napa				X	X	X
City of American Canyon				X	X	X
Town of Yountville					X	X
City of St. Helena					X	X
City of Calistoga					X	X
Napa Sanitation District			X	X	X	X
General Public			X			X
Napa City-County Library					X	

1.3 UWMP Public Hearing and Adoption

The Act requires that an UWMP be made available for public inspection and that a public hearing be held prior to adoption. The City of Napa UWMP 2005 update was completed in the weeks following acceptance of the regional 2050 Study. To best allow for public review of UWMP 2005, the public hearing and adoption vote were scheduled for the January 17, 2006 meeting of the Napa City Council to avoid the distractions of the end-of-year holidays. The draft UWMP 2005 was made available for public inspection beginning January 3, 2006 at the Public Works Department Building, the Water Division Building, and the Napa City-County Library. It was also posted on the City web site for greater public access. The public was invited to forward any comments to Water Division staff.

The general public was made aware of this schedule in several ways. The Winter 2005-06 issue of the Water Division's semi-annual newsletter, *The Reservoir*, included a feature article about the UWMP 2005 update. This newsletter was included with all customer water bills mailed out beginning in early December 2005. A copy is included in Appendix A. In accordance with the Act, the City also published notices in the local newspaper, the *Napa Valley Register*, once a week for two successive weeks prior to the public hearing. Copies of these December 29, 2005 and January 5, 2006 ads are included in Appendix A.

At the City Council Meeting of January 17, 2006, the UWMP 2005 update was summarized by staff and the public was invited to make comments. With no comments requiring UWMP modifications, the Council then voted to adopt the City of Napa UWMP 2005 as presented. Appendix B includes the adoption resolution, along with the City Council meeting agenda and the staff agenda summary report on UWMP 2005.

1.4 UWMP Format and Organization

This UWMP 2005 update includes all elements required by the Act and was written as a reader-friendly document for the citizens and officials of the City of Napa, and other interested local, regional, and State agencies. UWMP 2005 is divided into nine chapters. Following the introductory Chapter 1, Chapter 2 thoroughly describes the City of Napa water service area. Chapters 3 and 4 address the City's water supply sources and their reliability into the future. Chapter 5 looks at water demand by customer type. Chapter 6 summarizes the City's efforts in water conservation and references its CUWCC reporting for 2003 and 2004 (Appendix C). Chapter 7 deals with water shortage contingencies, including drought response and catastrophic water supply interruption. Chapter 8 summarizes the recycled water outlook. Chapter 9 concludes the document with a look at overall water system reliability, comparing supply and demand out to the year 2030. Many supporting documents are included in the appendices. Table 1-2 on the following page presents a road map to where each requirement of the Act is addressed in UWMP 2005.

Table 1-2
Water Code Checklist

State Water Code Section	Items to be addressed	UWMP 2005	
		Chapter	Section
10620(d)(1-2)	Coordination with Appropriate Agencies	1	1.2
10620(f)	Describe resource maximization/import minimization plan	3	3.7
10621(a)	Plan Updated in years Ending in Five and Zero	1	1.3
10621(b)	City and County Notification and Participation	1	1.2
10631(a)	Service Area Information	2	2.1-2.3
10631(b)	Water Sources	3	3.1-3.6
10631(b)(1-4)	If Groundwater identified as existing or planned source	3	3.5
10631(c)(1-3)	Reliability of Supply	4	4.1-4.5
10631(c)	Water Sources Not Available on a Consistent Basis	4	4.5
10631(d)	Transfer or Exchange Opportunities	3	3.5
10631(e)(1-2)	Water Use Provisions	5	5.1-5.3
10631(f)	Demand Management Measures	6	Appendix C
10631(g)	Non-implemented Demand Management Measures	6	Appendix C
10631(h)	Planned Water Supply Projects and Programs	3	3.5
10631(i)	Opportunities for development of desalinated water	3	3.5
10631(j)	Membership in California Urban Water Conservation Council	6	Appendix C
10631(k)	If Supplier receives or projects receiving water from a wholesale supplier	N/A	N/A
10631.5	Demand Management Measure Implementation Status	6	Appendix C
10632(a)	Water Shortage Contingency Plan: Stages of Action	7	7.3
10632(b)	Three-Year Minimum Water Supply	7	7.2
10632(c)	Preparation for catastrophic water supply interruption	7	7.7
10632(d)	Prohibitions	7	7.4
10632(e)	Consumption Reduction Methods	7	7.4
10632(f)	Penalties	7	7.4
10632(g)	Revenue and Expenditure Impacts	7	7.6
10632(h)	Water Shortage Contingency Ordinance/Resolution	7	7.1
10632(i)	Reduction Measuring Mechanism	7	7.5
10633	Recycling Plan Agency Coordination	8	8.1 Appendix F
10633(a)	Wastewater System Description	8	8.2
10633(a-d)	Wastewater Disposal and Recycled Water Uses	8	8.1-8.2 Appendix G
10633(e)	Projected Uses of Recycled Water	5 8	5.2 8.3 Appendix G
10633(f-g)	Plan to Optimize Use of Recycled Water	8	8.3 Appendix G
10634	Water quality impacts on availability of supply	4	4.5
10635(a)	Supply and Demand Comparisons: Normal, Single Dry, and Multiple Dry Year Scenarios	9	9.1-9.3
10635(b)	Provision of Water Service Reliability section to cities/counties within service area	To be provided	
10642	Public Participation and Plan Adoption	1	1.3
10643	Review of implementation of UWMP 2000	Various	Various
10644(a)	Provision of UWMP 2005 to local governments	To be provided	
10645	UWMP 2005 Availability for Public Review	To be provided	

CHAPTER 2

SERVICE AREA

2.1 Description of Service Area

The City of Napa is located at the northeast end of San Francisco Bay, within the Napa Valley, approximately 40 miles northeast of San Francisco. Incorporated in 1872, the City is the County Seat for Napa County. The City serves an area encompassing much of the lower Napa Valley and extending up the foothills on the east and west sides of the valley. As shown in Figure 2-1, the City's water service area contains three boundaries of importance:

- Designated water service area which includes most of the lower Napa Valley
- Rural Urban Limit (RUL) Line
- City Limits

The designated water service area encompasses an area much larger than the City can currently serve. It is the RUL that is the City's urban planning boundary and the primary area used for projecting future water demands. The City limits encompass about 95% of the area within the RUL, with the remaining 5% being unincorporated Napa County land. While the vast majority of City water is delivered to customers within the RUL, the City does serve water outside the RUL to customers in the Monticello Road/Silverado Resort community and the independent Congress Valley Water District (CVWD), and to accounts along the Conn Transmission Main. The CVWD is scheduled to be dissolved and its system purchased by the City in 2017.

The City also provides supplemental water to the Cities of American Canyon, St. Helena, and Calistoga, and the Town of Yountville. These entities are not retail customers of the City. Calistoga and Yountville have contractual entitlements to SWP water from the North Bay Aqueduct (NBA), and the City simply treats their water at its Jamieson Canyon Water Treatment Plant (WTP) and wheels it to them. The City has also performed this service for American Canyon, along with providing occasional emergency supplies for them and St. Helena. Because these entities do not directly impact City retail demand, they are excluded from the water service reliability (supply vs. demand) analysis in Chapter 9.

2.2 Population and Demographics

As in most cities, residential development is the predominant land use in Napa. Entering 2005, more than 90% of the City's water accounts were single-family or multi-family residential. Commercial and institutional customers are primarily confined to the downtown area and shopping complexes along several major streets. The City does serve about twenty agricultural accounts, primarily located along the Conn Transmission Main. By agreement, these are interruptible services that can be cut off in times of shortfall.

Recent infill development within the RUL reflects both the City's housing obligations and the expansion of tourist accommodations to support the Napa Valley wine industry. New hotels are planned or under construction both downtown and in the Napa Valley Corporate Park, a 240-

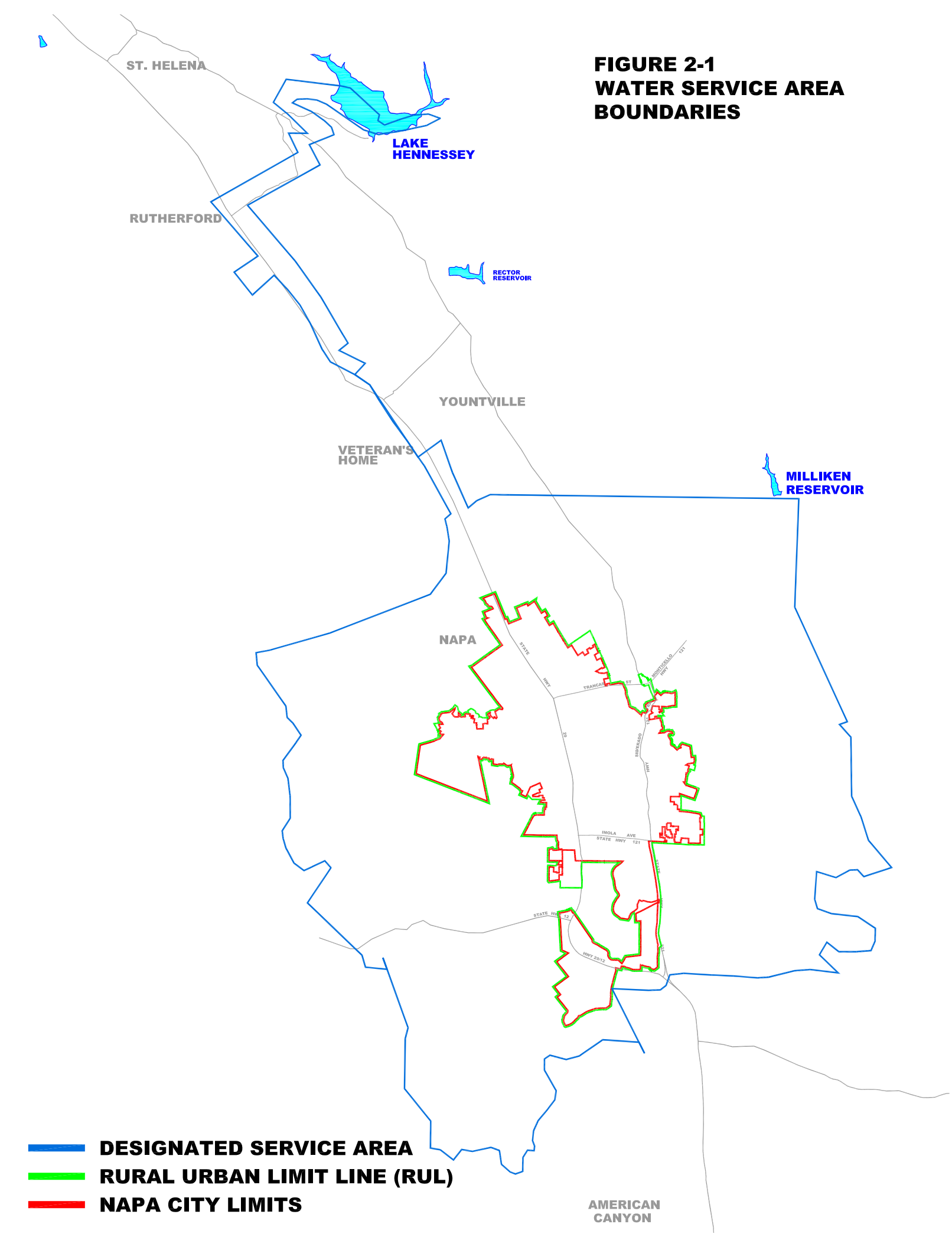


FIGURE 2-1
WATER SERVICE AREA
BOUNDARIES
ST. HELENA
LAKE
HENNESSEY
RUTHERFORD
RECTOR
RESERVOIR
YOUNTVILLE
VETERAN'S
HOME
MILLIKEN
RESERVOIR
NAPA
AMERICAN
CANYON
DESIGNATED SERVICE AREA
RURAL URBAN LIMIT LINE (RUL)
NAPA CITY LIMITS

acre office and light manufacturing complex in south Napa. More than 500 new apartment units have been added since 2000, and small single-family housing developments continue to be built within the RUL.

Chapter 5 breaks down water use by customer type and employs a per capita methodology for future demand projections. In the 2050 Study, this per capita use method was found to provide more conservative (higher) demand estimates than a land use methodology. For 2020 and beyond, the per capita method is based on population within the RUL only and a constant amount (900 AF per year) is added to the water projections to account for expected consistent demand outside the RUL.

Table 2-1
Projected Population

	2005	2010	2015	2020	2025	2030
Population in Napa RUL	81,200	86,000	89,900	93,000	95,350	97,750

The 2005 to 2020 RUL population numbers in Table 2-1 are from the Association of Bay Area Governments (ABAG) *Projections 2003* forecasting document. Because the City's General Plan assumes RUL build-out by 2020, a nominal growth rate of 0.5% per year is used to estimate the post-2020 populations. A more recent ABAG study, *Projections 2005*, shows somewhat lower RUL population projections, but the City is using the *Projections 2003* data in this UWMP because they are the most conservative (highest) for planning purposes. They are much higher and more realistic than the population data used in UWMP 2000. Using the most conservative population estimates available helps account for potential additional densification of the urban area, including mixed-use development anticipated in some remaining open parcels. The conservative population and water demand projections in this UWMP 2005 add confidence to the water service reliability analysis in Chapter 9.

2.3 Climate

The Napa climate is a significant factor in both annual water demand and demand seasonality. Best described as Mediterranean, the climate is characterized by hotter, dry summers and cooler, moist winters. Water demand may exceed 25 million gallons per day (MGD) during a hot spell in July, while dropping below 7 MGD in January. Landscape irrigation represents more than half of the annual water demand some years.

Table 2-2 summarizes relevant climate data, including average temperatures, precipitation, and evapotranspiration (ETo). The monthly ETo numbers represent the irrigation needs of standard cool-season turfgrass in Napa. More than 70% of annual ETo occurs in the months of May through September. This drives the demand for supplemental irrigation as these months have the lowest rainfall totals. Typically July, August, and September are rainless. There is, however, considerable variation in precipitation from year to year. An annual total of less than 13 inches can be anticipated one year in 20, while more than 36 inches can be expected with about the same frequency. Annual precipitation averages nearly 25 inches, but more than 80% of that total falls in the months of November through March, when plant water needs are at their lowest. The effect of summer landscape irrigation on overall Napa water demand has influenced the City's water conservation educational efforts, resulting in an annual Water-Wise Landscaping Workshop Series and the development of a *Water-Wise Gardening in the Napa Valley* CD-ROM. Additional landscape conservation measures are described in Appendix C.

Table 2-2
Average Climate Data for Napa

Month	Max. Temperature (°F)	Min. Temperature (°F)	Total Precipitation (inches per month)	ETo (inches per month)
January	57.5	37.9	4.87	1.03
February	61.9	40.5	4.55	1.53
March	65.7	41.7	3.33	2.93
April	70.0	43.3	1.65	4.71
May	74.8	47.2	0.70	5.82
June	80.0	51.1	0.23	6.85
July	82.0	53.0	0.02	7.21
August	81.9	52.8	0.08	6.44
September	82.2	51.2	0.28	4.87
October	76.6	47.5	1.39	3.53
November	66.3	42.2	3.07	1.64
December	57.9	38.5	4.59	1.17
Annual	71.4	45.6	24.75	47.73

Average temperature and precipitation data are from the Western Regional Climate Center, www.wrcc.dri.edu.
Average ETo data are from the Oakville weather station in the California Irrigation Management Information System (CIMIS).

Mild temperatures predominate in Napa, but highs in excess of 100°F have been observed at one time or another in every month from May through October. Nights cool off quickly. The average minimum temperature during the summer months is in the low 50's. Winter brings sub-freezing temperatures nearly every year. Historically, temperatures below 32°F have been recorded during each month from October through May. During the winter, daily temperatures climb into the upper 50's on average.

Under the influence of the nearby mountains and the flow of air through San Pablo Bay, wind direction is southwesterly most of the time and average speed is relatively light. Relative humidity average values during the summer may be around 60%, while in the winter they reach nearly 80%. Afternoon readings during most of the year will average 45% to 55%, while in the early morning hours the humidity will range from 80% to 90%.

ETo is somewhat affected by temperature, wind, and humidity, but the primary driving force is simply the amount of sunlight. Long summer days mean higher ETo, more landscape irrigation, and the demand seasonality discussed earlier.

CHAPTER 3

WATER SUPPLY SOURCES

3.1 Current Supplies

The City of Napa currently meets its demands by supplying water from three major sources:

- Lake Hennessey
- Milliken Reservoir
- State Water Project (SWP) water delivered through the North Bay Aqueduct (NBA)

Lake Hennessey and Milliken Reservoir are two local surface water reservoirs along tributaries of the Napa River. SWP water is supplied through an agreement with the NCFCWD, the SWP contract administrator for several municipalities in Napa County. Water from these three sources is introduced into the City of Napa distribution system from three separate water treatment plants. Hennessey WTP treats the Lake Hennessey supply. Milliken WTP treats Milliken Reservoir water. SWP water is treated at the Jamieson Canyon WTP southeast of the City. Figure 3-1 shows the locations of these treatment facilities and the major components of the water distribution system.

This chapter describes the three existing sources and the quantities available from them through 2030. Other potential supplies are also discussed, including transfer and exchange opportunities. The future reliability of these Napa supplies is covered in Chapter 4. The impacts of local recycled water projects are more thoroughly discussed in Chapters 5 and 8.

3.2 Lake Hennessey

Lake Hennessey is the major local water source for the City of Napa system. Located approximately 13 miles north of the City, Lake Hennessey was formed in 1946. Subdivision development by the 1940's proved taxing to the older Milliken Reservoir, which had served as the City's single water source for more than two decades. To assuage demands on Milliken, the City constructed Conn Dam, allowing storage of water from Conn Creek, an upvalley tributary of the Napa River. The resulting reservoir, Lake Hennessey, became the City's primary source for the next several decades until supplemented by SWP entitlements in the late 1960's.

The City's water rights to Lake Hennessey are secured through a license with the State Water Resources Control Board (SWRCB), Division of Water Rights. The license authorizes the City to divert and store up to 30,500 AF per year from Conn Creek for beneficial use. Lake Hennessey has an approximate storage capacity of 31,000 AF. Storage capacity represents the static volume of a reservoir at spillway elevation assuming no inflow or outflow, and is indicative of the absolute maximum yield in a wet year. Lake Hennessey's storage capacity is much greater than its average annual inflow of 19,692 AF. Its tributary watershed area is about 35,000 acres. These and other important Lake Hennessey statistics are listed in Table 3-1. Discussed in more detail in Chapter 4, average yield, reliable yield, and firm yield represent the annual supplies available during normal water years, multiple-dry year periods, and critical single-dry years, respectively.

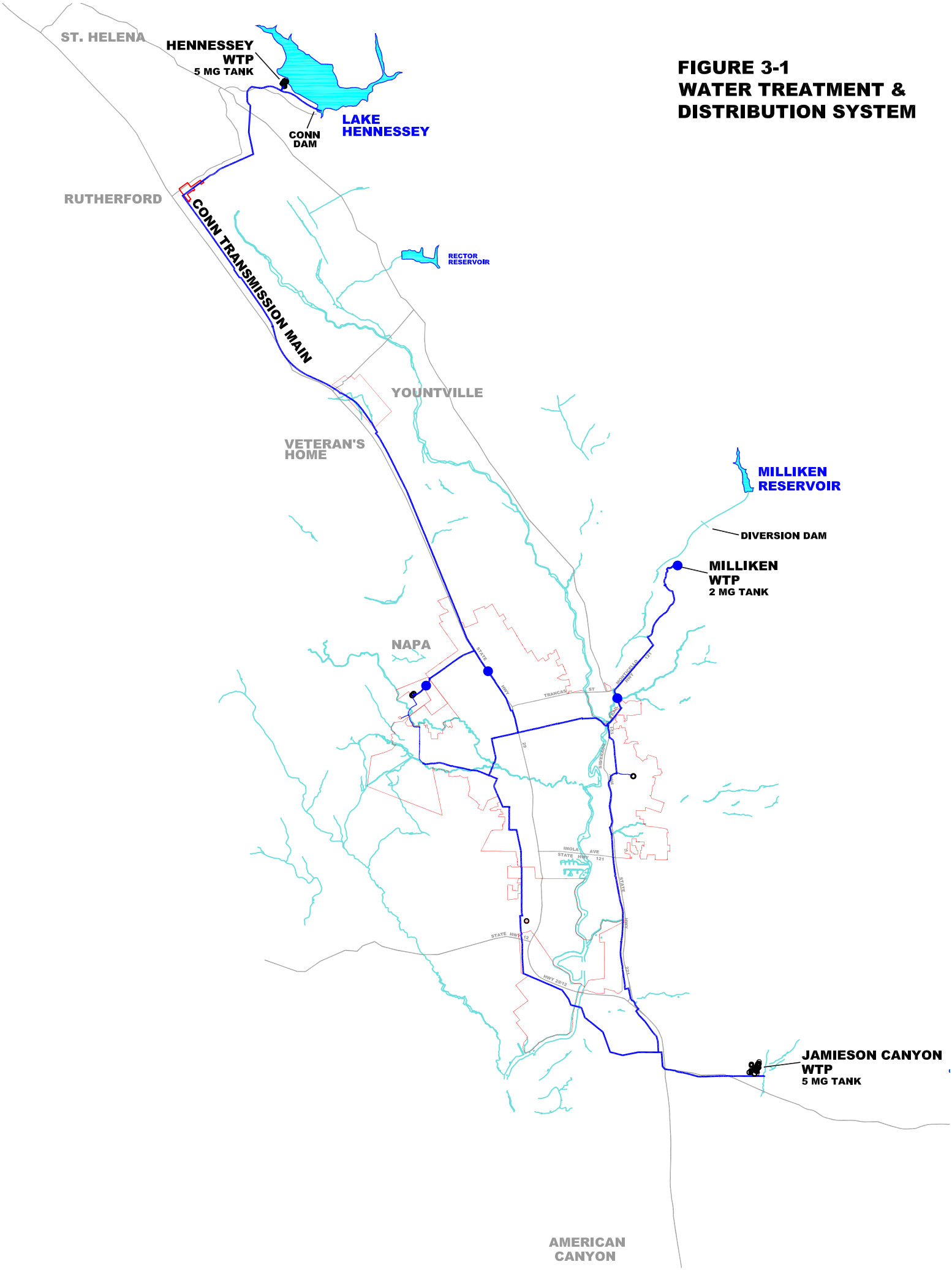


FIGURE 3-1
WATER TREATMENT &
DISTRIBUTION SYSTEM
ST. HELENA
HENNESSEY
WTP
5 MG TANK
LAKE
HENNESSEY
CONN
DAM
RUTHERFORD
CONN TRANSMISSION MAIN
RECTOR
RESERVOIR
YOUNTVILLE
VETERAN'S
HOME
MILLIKEN
RESERVOIR
DIVERSION DAM
MILLIKEN
WTP
2 MG TANK
NAPA
JAMIESON CANYON
WTP
5 MG TANK
AMERICAN
CANYON

Table 3-1
Lake Hennessey Statistics

Tributary Watershed Area	35,000 acres
Average Annual Inflow	19,692 AF
Total Storage Capacity (Maximum Yield)	31,000 AF
Average Yield	17,500 AF
Reliable Yield	10,417 AF
Firm Yield	5,000 AF

Raw water from Lake Hennessey flows into a cylindrical concrete intake tower and is pumped up to the Hennessey WTP. Hennessey WTP began operation in 1981 and has a nominal treatment capacity of 20 MGD. The facility provides complete conventional treatment, including flash mixing, coagulation, flocculation, sedimentation, filtration, and disinfection. Treated water from the plant is conveyed into a buried 5.0 million gallon concrete clearwell tank on site. This treated water is delivered to the distribution system through the 36-inch diameter Conn Transmission Main. The Conn Line is approximately 20 miles long and runs parallel to Conn Creek, Highway 128, and Highway 29. It travels along easements and right-of-ways before meeting the Jamieson Line in northwest Napa.

3.3 Milliken Reservoir

The City of Napa began offering water service in 1923 following its purchase of the privately-owned Municipal Water Works. This purchase coincided with the construction of Milliken Dam, which allowed storage of water from Milliken Creek, a tributary of the Napa River. The resulting Milliken Reservoir served as the City's sole water source until Lake Hennessey was created in the 1940's. Located approximately 5 miles northeast of the City, Milliken Reservoir is now a minor, secondary source of supply used only in the high-demand summer period when turbidity levels in the reservoir can be effectively treated at the Milliken WTP.

The Milliken watershed covers an area of roughly 6,000 acres. As with Lake Hennessey, the City's water rights to Milliken Reservoir are secured through a license with the SWRCB. It authorizes the City to divert and store up to 2,350 AF of water per year from Milliken Creek for beneficial use. Milliken Reservoir has an approximate storage capacity of 1,980 AF, somewhat smaller than its average annual inflow of 3,656 AF. The current storage capacity of Milliken Reservoir is limited to 1,390 AF due to seismic stability concerns by the State Division of Safety of Dams (DSOD) which requires the City to operate the reservoir at a reduced storage level. Like the 2050 Study, this UWMP assumes a maximum yield of only 700 AF in all but critical single-dry years. Key Milliken Reservoir statistics are summarized in Table 3-2.

Raw water is not taken directly from the reservoir, but is instead released into Milliken Creek by a manually operated valve system at the base of the dam. About two miles downstream, a diversion dam directs water into a 16-inch diameter above ground raw water line. That line then runs approximately one mile down to the Milliken WTP. This treatment facility was constructed in 1976 and has a treatment capacity of 4.0 MGD. It is a direct filtration plant with a contact/reaction tank and four horizontal, dual-media pressure filters operated in parallel. Treated water is stored in a 2.0 million gallon clearwell tank located above the treatment plant site. The treated water is delivered to the distribution system via the Milliken Transmission Line.

Approximately three miles long, the line serves customers in the Silverado Resort/Hillcrest areas before its joins the main system at the intersection of Silverado Trail and Monticello Road.

Table 3-2
Milliken Reservoir Statistics

Tributary Watershed Area	6,000 acres
Average Annual Inflow	3,656 AF
Total Storage Capacity(1)	1,980 AF
Maximum Yield	700 AF
Average Yield	700 AF
Reliable Yield	700 AF
Firm Yield	400 AF

(1) DSOD seismic concerns now limit this to 1,390 AF.

3.4 State Water Project

In 1966, 20 years after the addition of Lake Hennessey and more than 40 years after the creation of Milliken Reservoir, the City added a third source of supply by sub-contracting with NCFCWD for imported surface water from the SWP. The NCFCWD acts as the SWP contractor on behalf of municipalities in Napa County. The SWP diverts water from the Sacramento-San Joaquin Delta at the Barker Slough Pumping Plant east of Fairfield and conveys it approximately 21 miles via the NBA to Cordelia Forebay to serve contractors in Napa and Solano Counties. From there, SWP water is pumped an additional six miles to the Napa Turnout Reservoir, the 7 million gallon raw water storage tank for the Jamieson Canyon WTP built in 1968. The majority of this water represents SWP entitlements for the City of Napa, the Town of Yountville, and the City of Calistoga, all of which are treated at the Jamieson Canyon WTP. The remainder is City of American Canyon SWP entitlement conveyed via pipeline to the adjacent American Canyon WTP or delivered as raw water to American Canyon irrigation customers.

The original 1966 agreement with NCFCWD provided the City of Napa with gradually increasing annual allotments of the County's contracted SWP water, known as "Table A" entitlements, reaching a maximum of 12,500 AF by 1990. The agreement was modified in 1982 as a result of DWR efforts to encourage implementation of water conservation programs. The modified agreement reduced the City's short-term Table A entitlement, but increased its final overall entitlement to 18,800 AF by 2021. In 1999, the City negotiated an acceleration of this entitlement schedule, helping to increase near-term supply options. The City's Table A entitlement schedule for 2005 and beyond is shown in Table 3-3. These amounts represent the absolute maximum annual yields of Table A water. Actual deliveries are determined by DWR depending on each year's hydrologic conditions. A full 100% of the entitlement would typically be available only during wet years. Reliability of the City's SWP supply in normal, multiple-dry, and critical single-dry year scenarios is discussed in detail in Chapter 4. The current SWP contract is due to expire in 2035 with extension occurring as necessary.

In 2000, the City obtained an additional 1,000 AF per year of SWP water in a transfer

Table 3-3
SWP Table A Entitlement Schedule
For the City of Napa

Year	Table A Entitlement (AF)	w/ KCWA Purchase (AF)
2005	12,850	13,850
2006	13,100	14,100
2007	13,350	14,350
2008	13,600	14,600
2009	13,850	14,850
2010	14,100	15,100
2011	14,350	15,350
2012	14,600	15,600
2013	14,800	15,800
2014	15,100	16,100
2015	15,700	16,700
2016	16,300	17,300
2017	16,900	17,900
2018	17,500	18,500
2019	18,100	19,100
2020	18,700	19,700
2021	18,800(1)	19,800(1)

(1) And each succeeding year thereafter for the term of the contract.

agreement between NCFCWD and the Kern County Water Agency (KCWA). Negotiated on behalf of five cities in Napa County, the agreement established terms for the permanent purchase of 4,025 AF of annual SWP entitlement from KCWA. Napa and St. Helena purchased the largest shares of this total at 1,000 AF each. The remaining agencies accepted lesser shares ranging from 500 AF to 925 AF. This additional purchase helps to ensure adequate supplies are available in times of drought well into the future. Total SWP supplies for the City of Napa are listed in the third column of Table 3-3, which includes the 1,000 AF from KCWA.

All of the City's SWP raw water is processed at the Jamieson Canyon WTP. Constructed in 1968, the plant was upgraded in 1988 to provide a rated treatment capacity of 12 MGD. It can currently be run at 15 MGD if needed. This facility is a conventional surface water treatment facility with flash mixing, flocculation, sedimentation with tube settlers, gravity filtration, and disinfection. Treated water is stored in a 5.0 million gallon clearwell tank on site. The Jamieson Transmission Line delivers the potable water to the City. It consists of a 42-inch diameter line that runs parallel to Jamieson Canyon Road to Highway 29, which then splits into 36-inch and 24-inch lines near the intersection of Highways 29 and 221 as it joins the rest of the distribution system.

3.5 Other Potential Sources

The City is either involved in or considering several opportunities to enhance its water supply for the future. These include more efficient use of SWP options, treatment plant capacity enhancements, water transfers, potential groundwater projects, and increased use of recycled water. Due to the "potential" nature of most of these efforts, their supplies are not quantified here nor are they included in the total supply projections in Section 3.6. As projects are finalized or agreements made, their supply contributions will be quantified in future updates to the UWMP.

Additional SWP

In addition to the Table A entitlement and the 2000 KCWA purchase, the SWP contract provides for other options. "Carryover Water" is water from a previous year's entitlement that was available for use, but exceeded demands, and was therefore stored for use in subsequent years. Carryover water is stored in San Luis Reservoir and if San Luis Reservoir spills, the carryover water is considered the first water to be lost. The City typically uses carryover water in the first few months of the year and will continue to do so. Over the long term, this is not considered new supply but simply taking better advantage of existing SWP entitlements.

"Article 21 Water" is an interruptible surplus SWP supply the City has used. Article 21 of the SWP contract allows for the purchase of surplus water beyond the Table A quantities, provided that the contractor can take delivery during the wet season without affecting Table A deliveries to other contractors. NCFCWD uses an annual delivery schedule that maximizes the City's use of Article 21 water following consumption of carryover water.

Each year, DWR decides whether to operate a dry year purchase program based on Article 56 of the SWP contract. A "Turn-Back Pool" may be established with water from agencies not using their full entitlement distributed to other agencies requesting additional supplies. NCFCWD has purchased water through the program and will continue to do so, but it is not considered a reliable source due to its unpredictable nature.

The City will also explore opportunities for purchasing additional Table A entitlements, either within Napa County or externally (e.g., KCWA). Water transfer negotiations can take many years and the City has already initiated discussions with interested agencies.

Treatment Plant Projects

First identified in the 1997 Master Plan, the Jamieson Canyon WTP Improvements Project is the City's highest priority for addressing its water supply needs. The project will increase the treatment capacity of the plant from 12 MGD to approximately 20 MGD. With the Jamieson plant's current 12 MGD limited capacity, the City is not able to treat all of its entitled water supplies from the SWP. While not actually creating new supply, the plant capacity expansion will have essentially the same effect, allowing the City to finally use supplies to which it is entitled. By using more of its SWP water in the future, the City is better able to preserve its local reservoirs for dry years. The project is expected to be completed by 2009.

The City may consider modifications to the Milliken WTP so that Milliken Reservoir could be used as a source year-round. Supply is only enhanced if use of Milliken reduces the supply

required from Hennessey or Jamieson Canyon. However, since Lake Hennessey spills frequently, it is not clear whether this project is worth the investment.

Dry Year Supplies

The top project recommendation of the 2050 Study is for Napa County agencies to take advantage of NBA conveyance capacity by importing dry year supplies from outside the County. Known as the "Fill the Pipe" option, this would require negotiation of a long-term transfer agreement for reliable dry year supplies from agencies such as Butte County, the City of Vallejo, and Sacramento River users. The City may consider joining with a larger group of SWP contractors in such a negotiation/acquisition process.

Groundwater

The City of Napa currently relies on surface water supplies exclusively and has no programs in place involving groundwater or conjunctive use. The 2050 Study identified several potential groundwater options that the City may consider in the future. One involves handling excess SWP entitlements by storing the water in groundwater wells along the NBA pipeline in Solano County. The others involve the use of new or existing wells in the local groundwater basin. Potential new wells would include a municipal well to be used exclusively for dry year supplies and on-site wells to provide non-potable water for schools and parks. There are a number of large wells on the former Napa Pipe industrial site. If this site is developed in the future, the existing wells could potentially meet the site's water demands.

Recycled Water

The City of Napa is a drinking water supplier only. Wastewater from the City and surrounding unincorporated areas is treated by a separate special district, the Napa Sanitation District. NSD produces recycled water at their Soscol Water Recycling Facility (WRF). A 1998 agreement governs the sale of NSD recycled water to City customers. The first City customer switching to NSD recycled water was Napa Municipal Golf Course in 2003. The City will continue working with NSD to further expand the use of their recycled water to meet non-potable demands within the City's service area. The City recognizes the value of recycled water as a locally produced, reliable, drought-proof source of supply. When a City customer switches to NSD recycled water for their irrigation needs, demands on the City water system are reduced. Therefore, recycled water quantities have been addressed as future demand reductions in Chapter 5 and not as additional City supply in this chapter. The future recycled water outlook for the City is discussed in Chapter 8, including reference to the new NSD Strategic Plan.

Desalinated Water

The City of Napa currently does not have a desalination program, nor plans to implement one.

3.6 Total Supply Projections

Table 3-4 shows total available water supplies for the City of Napa from 2005 to 2030. The table includes quantities available from known sources and assumes maximum yield for local reservoirs and full entitlements for SWP water. Available supplies increase gradually through 2021 due to the escalating entitlement schedule in the SWP contract. Supplies level off at 50,500 AF after 2021 unless additional NBA *conveyance capacity* is purchased.

The reliability of these supplies in normal, multiple-dry years, and critical single-dry year scenarios are examined in Chapter 4. Chapter 9 summarizes supply vs. demand and overall City water service reliability to 2030.

Table 3-4
Total Water Supplies 2005-2030 (AF/year)[1]

Water Supply Source	2005	2010	2015	2020	2025	2030
Lake Hennessey	31,000	31,000	31,000	31,000	31,000	31,000
Milliken Reservoir	700	700	700	700	700	700
State Water Project *Table A*	12,850	14,100	15,700	18,700	18,800	18,800
State Water Project *Kern County Water Agency*	1,000	1,000	1,000	1,000	1,000	1,000
Total	45,550	46,800	48,400	50,500[2]	50,500[2]	50,500[2]

(1) Assuming maximum yield/full entitlement for all sources.
(2) Total State Water Project supply limited to 18,800 AF/year due to contracted NBA conveyance capacity.

3.7 Resource Maximization/Import Minimization

Section 10620(f) of the State Water Code requires the UWMP to discuss how water management tools are used to maximize resources and minimize the need to import water from other regions. As shown in Table 3-4, Lake Hennessey is the predominant supply for the City of Napa. To preserve the quantities available in this local reservoir during dry years, the City is pursuing a policy of optimizing use of its existing entitlements of imported SWP water. Projects such as the Jamieson Canyon WTP expansion give the City flexibility in terms of water management options during drought periods. For example, the City may opt to use Lake Hennessey primarily during low rainfall years when SWP allotments are cut back, keeping more water in the lake other years and increasing the chances of spilling. This will improve local water supply reliability and help avoid situations like the 1989-91 period. In those drought years, low levels in Lake Hennessey and Milliken Reservoir combined with SWP cutbacks caused the City to import supplemental water from the Yuba County Water Agency.

Overall resource maximization is being addressed primarily through increased water conservation measures and expansion of local recycled water use for non-potable demands. The City's water conservation programs are discussed in Chapter 6 and Appendix C.

CHAPTER 4

RELIABILITY OF SUPPLY

4.1 Definitions

The year-to-year reliability of water supplies from Lake Hennessey, Milliken Reservoir, and the SWP depends on various legal, environmental, water quality, and climatic factors. Climate in the form of annual precipitation and runoff in the affected watersheds is the critical factor used in projecting the future reliability of City of Napa sources. The Act requires this UWMP to estimate supplies available during an average water year, multiple-dry year periods, and critical single-dry year conditions. Before addressing this requirement, some definitions are in order:

Average (Normal) Year – A year in the historical sequence that most closely represents median runoff levels and patterns.

Multiple-Dry Year Period – A period generally considered to have the lowest average runoff for a consecutive multiple year period (three years or more) for a watershed since 1903.

Single-Dry Year – A critical year generally considered to have the lowest average runoff for a watershed since 1903.

Average Yield – Based on historical data, amount of water that can be supplied from reservoir storage during a normal year.

Reliable Yield – Based on historical data, annual amount of water that can be guaranteed from reservoir storage during multiple-dry years

Firm Yield – Based on historical data, amount of water that can be guaranteed from reservoir storage during a critical single-dry year.

Probability of Exceedence – The probability that a given reservoir yield could be exceeded in a given year, based on statistical analyses of the historical data. By definition, the firm yield would have a probability of exceedence of 100%, while the maximum yield would have a probability of exceedence of 0%.

Depletion – Annual drawdown from reservoir storage during drought conditions.

4.2 State Water Project Reliability

The ability of the SWP to deliver water to its contractors in any given year depends on a number of factors, including rainfall, size of snowpack, runoff, water in storage, and pumping capacity in the Delta. The actual delivery, or yield, varies from year to year and is described as a percentage of the contractual entitlement. For the City of Napa, annual SWP deliveries are a percentage of Table A plus KCWA water. While a full 100% of this entitlement may be available in a very wet year, lesser amounts are delivered in normal, single-dry, and multiple-dry years.

Matching the 2050 Study methodology, UWMP 2005 employs data from the *SWP Delivery Reliability Report 2002*, published by DWR in 2003. This is the most recent final reliability report issued by DWR. DWR is preparing an update but its final report was not available at the time of preparation of this UWMP. In May 2005, DWR did issue relevant sections from the working draft of that update. Only the single-dry year delivery numbers differed significantly from the 2002 study, as noted below.

Table 4-1 summarizes SWP reliability data obtained from *SWP Delivery Reliability Report 2002*. The normal, multiple-dry, and single-dry year delivery percentages can be looked upon as the average, reliable, and firm yields of the SWP source. Its firm yield of 20%, based on the 1977 critical year, is much more conservative than the 50% estimate used in the City's 1997 Master Plan and UWMP 2000. The recent draft DWR reliability update includes deliveries as low as 4-5% for that critical year condition. The City may examine that scenario in future UWMP updates, but in UWMP 2005 the City is confident of the conservative nature of the 20% firm yield, particularly in that no carryover water is being assumed for the single-dry year condition.

SWP Delivery Reliability Report 2002 contains two projections for Year 2021 SWP deliveries using the CALSIM II model. The probabilities of exceedence in Table 4-1 were derived from the SWP yield curves of those CALSIM II projections. The percent exceedences show that the water year data are not normally distributed (i.e., the median is not equal to the average). Consequently, the normal or average year SWP delivery is not exceeded 50% of the time. It is exceeded 60% of the time.

Table 4-1
State Water Project Reliability Assumptions

Water Year Type	Projected SWP Delivery (percent of entitlement)	Base Year(s)	Probability of Exceedence (percent)
Normal Year	76%	1922-1994	60%
Multiple-Dry Years	40%	1987-1992	85%
Single-Dry Year	20%	1977	100%

Because City of Napa SWP Table A entitlements are scheduled to increase until 2021, the estimated actual SWP deliveries (AF) for these three water year scenarios will also increase through then. Table 4-2 estimates SWP deliveries through 2030 by applying the delivery percentages in Table 4-1 to the escalating entitlements from Table 3-3 including the KCWA purchase (1,000 AF).

For 2021 and beyond, the City can expect about 15,048 AF from the SWP in normal years, 7,920 AF annually during multiple-dry year periods like the 1987-1992 drought, and only about 3,960 AF in a critical single-dry year like 1977. None of these deliveries will be limited by the contracted NBA conveyance capacity of 18,800 AF. These SWP delivery estimates assume no carryover water, Article 21 water, or any of the other supplemental categories described in Section 3.5.

Table 4-2
Estimated State Water Project Deliveries 2005-2030
For Three Different Water Year Conditions (AF)

Year	Normal Year	Multiple-Dry Years	Single-Dry Year
2005	10,526	5,540	2,770
2006	10,716	5,640	2,820
2007	10,906	5,740	2,870
2008	11,096	5,840	2,920
2009	11,286	5,940	2,970
2010	11,476	6,040	3,020
2011	11,666	6,140	3,070
2012	11,856	6,240	3,120
2013	12,008	6,320	3,160
2014	12,236	6,440	3,220
2015	12,692	6,680	3,340
2016	13,148	6,920	3,460
2017	13,604	7,160	3,580
2018	14,060	7,400	3,700
2019	14,516	7,640	3,820
2020	14,972	7,880	3,940
2021	15,048	7,920	3,960
2022	15,048	7,920	3,960
2023	15,048	7,920	3,960
2024	15,048	7,920	3,960
2025	15,048	7,920	3,960
2026	15,048	7,920	3,960
2027	15,048	7,920	3,960
2028	15,048	7,920	3,960
2029	15,048	7,920	3,960
2030	15,048	7,920	3,960

4.3 Local Reservoir Reliability

Water year types do not necessarily coincide between local reservoirs and the SWP. For example, a normal rainfall year in the Lake Hennessey watershed area may occur the same year as a dry year for the SWP watershed area. For UWMP 2005, the City is assuming that dry years occur in both the SWP and local watersheds at the same time. This makes for a more conservative estimate of supply reliability.

Applying the SWP probabilities of exceedence from Table 4-1 to known reservoir yield curves for Lake Hennessey and Milliken Reservoir results in the estimated local reservoir yields in Table 4-3. As noted earlier, the yield curve for Milliken Reservoir was modified due to DSOD seismic concerns, resulting in average and reliable yields of just 700 AF, despite the reservoir's natural storage capacity of 1,980 AF.

Table 4-3
Estimated Local Reservoir Yields
For Three Different Water Year Conditions (AF)

Source	Normal Year	Multiple-Dry Years	Single-Dry Year
Lake Hennessey	17,500	10,417	5,000
Milliken Reservoir	700	700	400
Total Local Reservoirs	18,200	11,117	5,400

While the local reservoir *yields* are significantly decreased under the dry year conditions, additional drawdown of the reservoirs would be employed to supplement supplies during an actual drought. UWMP 2005 uses drought assumptions from the 2050 Study to calculate these storage *depletion* amounts. For the single-dry year case, it was assumed that each reservoir would be drawn down 25% following a normal year. For the multiple-dry year case, it was assumed that reservoir drawdown would be 50% over six years following a normal year. For Milliken, the annual depletion would be spread evenly over the six years at 8.33% per year. For Lake Hennessey, an initial depletion of 25% would be followed by five years at 5% to simulate the impacts of starting a multi-year drought with a single-dry year. The storage depletion estimates are summarized in Table 4-4.

Table 4-4
Estimated Local Reservoir Depletion
For Single and Multi-Year Drought Conditions (AF)

Source	Single-Dry Year	Multiple-Dry Years					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Lake Hennessey[1]	6,500	6,500	1,300	1,300	1,300	1,300	1,300
Milliken Reservoir[2]	100	33	33	33	33	33	33
Total Local Reservoir Depletion	6,600	6,533	1,333	1,333	1,333	1,333	1,333

(1) Assumed to start with 26,000 AF remaining storage after normal year.
(2) Assumed to start with 400 AF remaining storage after normal year.

4.4 Total Supply Reliability

Table 4-5 adds the SWP yields, the local reservoir yields, and the assumed local reservoir depletion amounts to estimate the City of Napa's reliable supply for post-2021 normal, single-dry, and multiple-dry water years. After 2021, the City will have reached its final SWP Table A entitlement under the current contract. Chapter 9 compares supply and demand for the earlier years, showing the impacts of the escalating SWP entitlement on water service reliability. In Table 4-5, the single-dry year case is clearly the most critical, with reliable supplies just 48% of normal year supplies. The latter stages of a multiple-dry year period are expected to still have about 61% of normal year supplies available.

Table 4-5
Reliability of Supplies After 2021
For Three Different Water Year Conditions (AF)

Source	Normal Year	Single-Dry Year	Multiple-Dry Years					
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
SWP Deliveries	15,048	3,960	7,920	7,920	7,920	7,920	7,920	7,920
Local Reservoir Yields	18,200	5,400	11,117	11,117	11,117	11,117	11,117	11,117
Local Reservoir Depletion		6,600	6,533	1,333	1,333	1,333	1,333	1,333
Total Reliable Supply	33,248	15,960	25,570	20,370	20,370	20,370	20,370	20,370
% of Normal	100%	48%	77%	61%	61%	61%	61%	61%

4.5 Factors Affecting Supply Reliability

The primary factors that can cause inconsistency in the year-to-year availability of water supplies are described below.

Climatic

As discussed earlier, weather patterns that affect hydrologic conditions help to determine SWP deliveries. In a critically dry year, SWP contractors may get as little as 20% or less of their annual entitlement. By using SWP as a source, the City is somewhat dependent on precipitation in the Sacramento and San Joaquin River Basins. But with local reservoirs augmenting the SWP source, the City is not as vulnerable to climatic effects as it would be without this supply flexibility. Of course the weather patterns and annual rainfall in the Lake Hennessey and Milliken Reservoir watersheds affect the yield from these local sources. With the conservative assumption that dry conditions will always occur simultaneously in the SWP and local watersheds, the City is confident of the minimum reliable supplies presented in UWMP 2005 for single-dry and multiple-dry year conditions.

Environmental

SWP water is conveyed through the NBA from the Sacramento-San Joaquin Delta. With more than 20 million Californians and millions of acres of irrigated farmland relying on the Delta for water, it is the hub of the State water distribution system. With runoff from two major river systems flowing into San Francisco Bay, the Delta is also a productive habitat for wildlife, including several endangered species.

In 1994, State and Federal agencies joined together to form the CALFED Bay-Delta Program. CALFED is charged with developing and implementing a long-term plan to restore the ecological health and improve water management of the Delta. The Delta serves as a migration pathway for salmonid species traveling between their home streams and the Pacific Ocean. It is also home to the tiny Delta Smelt, a threatened species of fish requiring protection. Protection of the Delta Smelt involves periodic pumping restrictions affecting Delta water exports. These restrictions are not expected to have an impact on SWP supplies to the NBA for the City of Napa.

Legal

As discussed earlier, the City's SWP water supply is governed by an agreement with NCFCWCD, who acts as the SWP contractor on behalf of several municipalities in Napa County. The current agreement provides the City with escalating annual entitlements, reaching 19,800 AF in 2021 and continuing at that level through 2035 when the contract is due to expire. It is anticipated that the contract will be extended after that time.

Through licenses with the SWRCB, the City has a legal entitlement to use water from Lake Hennessey and Milliken Reservoir. These appropriative water rights allow the City to divert and store up to 30,500 AF per year from Conn Creek and 2,350 AF per year from Milliken Creek for beneficial use. The licenses do require the City to allow sufficient releases from the reservoirs to provide minimum stream flows, but these requirements do not significantly affect supply reliability.

Water Quality/Treatment

The City does not expect water quality issues to negatively impact supply reliability over the next 25 years. The City consistently meets drinking water standards prescribed by the U.S. Environmental Protection Agency (EPA) and the California Department of Health Services (DHS). SWP source water can provide a challenge for the Jamieson Canyon WTP during winter storms when elevated levels of turbidity occur. Improved watershed management practices may help mitigate that issue in the future. As discussed in Chapter 3, the capacity of the Jamieson Canyon WTP is a bigger concern than the quality of its finished product. The Jamieson Canyon WTP Improvements Project will expand the treatment capacity to 20 MGD, finally allowing the City to take advantage of its existing SWP entitlement and providing more flexibility to prepare for droughts.

Raw water quality is an issue for the Milliken Reservoir as higher turbidity levels in the fall, winter, and spring prevent the effective operation of its direct filtration treatment plant. The City is considering modifications to Milliken WTP so that this reservoir can be used as a supply source year-round. The supply reliability data in UWMP 2005 reflect the current practice of using Milliken supplies only during the summer months when lower turbidity levels can be effectively treated.

CHAPTER 5

WATER USE BY CUSTOMER TYPE

5.1 Historical Water Demand

As discussed in Chapter 2, the City of Napa serves primarily residential customers. Historically, single-family and multi-family residential accounts make up more than 90% of the City's total. Table 5-1 presents the actual number of metered water accounts broken down by customer type for the completed calendar years since UWMP 2000. Excluding standby fire sprinkler accounts which are not included in the table, the City of Napa system is fully metered and customers are billed by volume of use. Since UWMP 2000 was filed, the system has surpassed 24,000 accounts.

Table 5-1
Historical Accounts By Customer Type

Customer Type	Number of Accounts				
	2000	2001	2002	2003	2004
Single-Family Residential	20,273	20,524	20,563	20,733	20,904
Multi-Family Residential	1,364	1,367	1,360	1,365	1,379
Commercial	1,418	1,424	1,421	1,424	1,430
Industrial	3	2	2	2	2
Institutional/Government	240	242	242	241	240
Landscape Irrigation	204	209	221	222	252
Agricultural Irrigation(1)	11	14	15	16	16
Miscellaneous Accounts(2)	38	39	42	40	38
Total	23,551	23,821	23,866	24,043	24,261

(1) Interruptible-Surplus Agricultural Water Agreements with customers outside the City limits.
(2) Special manually-invoiced accounts including hydrant meters and Napa State Hospital.

The recent annual water use for these accounts is summarized in Table 5-2. With known unmetered uses and unaccounted-for water included, the table reflects the true total demand on the system for all retail customers inside and outside the RUL. Water treated and wheeled to other local agencies is not included as it does not impact City of Napa supplies. These sales to other agencies are discussed in Section 5.4.

While more than 20,000 accounts are single-family residential, just over half of the actual water demand comes from this sector. The commercial sector of course represents a disproportionate share of demand, with hotels and other businesses that serve the public at large. Industrial use is not a significant component of Napa's demand. Institutional/government demand is comparable to the landscape irrigation sector, each with more than 700 AF of use in 2004. Landscape irrigation use is concentrated in the summer months when ETo is highest. The City requires all projects with 5,000 square feet or more of landscaping to have a dedicated irrigation account.

The agricultural sector represents vineyard owners outside the City limits who have signed Interruptible-Surplus Water Agreements with the City. The annual use fluctuates based on weather conditions and the vineyards' use of wells and other alternative sources. Service to these accounts is stopped when the City declares a municipal water shortage. The miscellaneous accounts in the table include hydrant meters used mainly for construction projects, along with manually invoiced accounts like Napa State Hospital, several of which may be switching to NSD recycled water for landscaping. The reduced demand in this sector in 2003 and 2004 already reflects the Napa Municipal Golf Course switch to NSD supply.

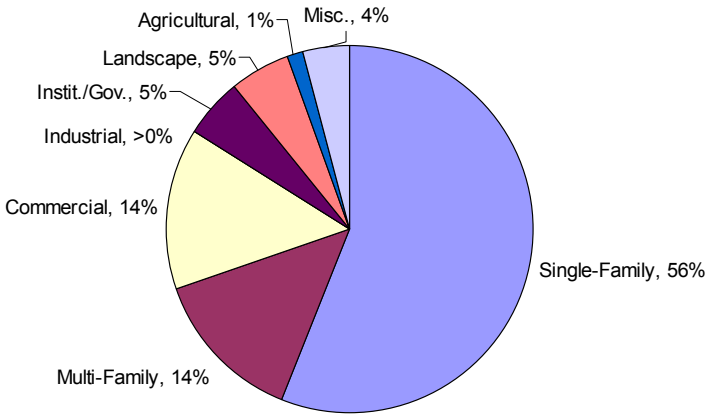
Table 5-2
Historical Demand By Customer Type

Customer Type	Annual Water Use (AF)				
	2000	2001	2002	2003	2004
Single-Family Residential	7,161	7,493	7,561	7,443	7,914
Multi-Family Residential	2,017	2,090	1,975	1,932	1,934
Commercial	2,026	2,033	2,015	1,941	2,002
Industrial	2	1	1	9	1
Institutional/Government	712	737	674	457	731
Landscape Irrigation	529	556	662	654	770
Agricultural Irrigation[1]	198	172	170	110	173
Miscellaneous Accounts[2]	819	833	862	670	594
Known Unmetered Uses[3]	89	66	102	45	45
Unaccounted-For Water	1,817	1,919	2,096	1,083	1,051
Total	15,370	15,900	16,118	14,344	15,215

(1) Interruptible-Surplus Agricultural Water Agreements with customers outside the City limits.
(2) Special manually-invoiced accounts including hydrant meters and Napa State Hospital.
(3) Unmetered uses and losses from activities such as main flushing, large main breaks, and Hennessey WTP de-sludging.

The percentage of use by customer type in 2004 is shown in Figure 5-1. The pie represents actual use by metered customers. System unmetered uses and losses are excluded.

Figure 5-1
Water Use By Customer Type for 2004



Residential water use makes up 70% of the total, 56% for single-family plus 14% for the multi-family sector. Commercial users consume the next largest share at 14%, with the remaining 16% divided among the other customer types. This distribution of water use in calendar year 2004 is typical of the City's recent history. These percentages are not expected to change significantly as the City experiences mixed-use development in the future that is strongly weighted toward residential.

5.2 Demand Projection Methodology

To project total City retail demand for future years, UWMP 2005 employs the per capita demand method used in the 2050 Study. This per capita demand method was used in the 2050 Study because it showed somewhat higher water use projections than a land use method. These more conservative per capita results are now used for planning purposes.

For the years prior to the General Plan RUL build-out in 2020, the 2050 Study first assumed a current year 2005 total system demand of 15,370 AF, slightly higher than actual demand for the two previous years and matching the use patterns seen in 2000. Based on metered use through November 2005, this 2005 total looks to be slightly high, but conservative for planning purposes. For 2005 to 2015, it is assumed that total system demand will grow at the same rate as the population served. A rate of 1.3% per year is used, based on the average annual population growth over the past decade.

For the year 2020 and beyond, the 2050 Study used a conservatively high year 2020 RUL population estimate from ABAG and employed the techniques and assumptions described below:

Baseline Per Capita Demand

A baseline per capita demand of 180 gallons per capita per day (gpcd) was assumed for the population inside the RUL. This is a conservatively high gpcd based on the average per capita demand on the system in the early 2000's. It represents a 4% reduction in gpcd compared to the mid-1980's average prior to the last major drought of 1987-1992. The 4% reduction is attributed to permanent water conservation programs instituted by the City.

Demand Inside the RUL

This demand is calculated by using 180 gpcd and the population within the RUL. Because the baseline 180 gpcd included unaccounted-for water, that is stripped out by dividing by 1.1 (10% unaccounted-for). The projected RUL population data for 2020-2030 were shown earlier in Table 2-1. The ABAG projection of 93,000 is used for 2020. After the RUL build-out in 2020, population is assumed to grow at a nominal rate of 0.5% per year.

Demand Outside the RUL

This demand is assumed to be constant at 900 AF per year based on Master Plan data.

Recycled Water Adjustments

A 300 AF addition for Napa State Hospital demand is included rather than 400 AF due to an assumed switch to NSD recycled water for their non-potable use. A reduction of 166 AF accounts for Napa Municipal Golf Course and Kennedy Park switching to NSD recycled water.

Veterans Home

The City assumes the possibility of supplying 100 AF annually to the California Veterans Home in Yountville.

Water Conservation

As will be shown in Chapter 6 and Appendix C, the City of Napa has expanded its conservation programs to achieve permanent long-term demand reduction. The 2050 Study assumes an additional 6% conservation savings are achieved by 2020. This means a total conservation savings of 10% compared with the pre-drought mid-1980's. The City believes these assumed savings levels may be conservative when compared with the overall potential of the programs described in Appendix C.

The additional 6% water conservation for 2020 and beyond has the effect of reducing total projected City demand by the following amounts:

2020	-1,091 AF
2025	-1,117 AF
2030	-1,143 AF

Unaccounted-For Water

Unaccounted-for water is assumed to be 10% of demand, based on the range of 7-13% experienced since 2000. This is likely a conservative assumption as aggressive meter, main, and plastic service replacement programs have kept the City's unaccounted-for water below 8% for the past three years.

Using the 2050 Study methodology, total demand from 2005 to 2030 is calculated and presented in Table 5-3. The data reflect normal year demands, and incorporate long-term conservation savings as described above. Drought year demands are assumed to be 15% below these normal year demands, as shown in the Chapter 9 water service reliability analysis.

Table 5-3
Total Water Demand 2005-2030 (AF/year)

Category	2005	2010	2015	2020	2025	2030
Total City System Demand	**15,370**[(1)]	**16,395**	**17,489**	**18,798**	**19,243**	**19,699**

(1) Based on metered use through November 2005, this starting year assumption of 15,370 AF looks slightly higher than actual.

5.3 Projected Water Use By Customer Type

The total demand projections are broken down by customer type here in Table 5-4. Table 5-5 below shows the number of accounts projected for each sector. The distribution of water use and accounts among customer types is expected to remain similar to the distribution in calendar year 2004. Industrial will continue to represent a very small portion of demand, while residential use will dominate. The commercial sector will grow to serve the increasing population, and new hotels are anticipated to serve wine country tourists. The City is also expected to sign additional Interruptible-Surplus Water Agreements with willing vineyard customers.

Table 5-4
Water Demand By Customer Type 2005-2030

Customer Type	Annual Water Use (AF)					
	2005	2010	2015	2020	2025	2030
Single-Family Residential	7,807	8,329	8,887	9,554	9,781	10,013
Multi-Family Residential	1,908	2,036	2,172	2,335	2,390	2,447
Commercial	1,975	2,107	2,248	2,417	2,474	2,533
Industrial	1	2	2	2	2	2
Institutional/Government	721	769	821	882	903	925
Landscape Irrigation	760	810	865	930	952	974
Agricultural Irrigation[1]	171	182	194	209	214	219
Miscellaneous Accounts[2]	585	625	665	715	733	750
Known Unmetered Uses[3]	45	45	45	45	45	45
Unaccounted-For Water	1,397	1,490	1,590	1,709	1,749	1,791
Total	**15,370**	**16,395**	**17,489**	**18,798**	**19,243**	**19,699**

(1) Interruptible-Surplus Agricultural Water Agreements with customers outside the City limits.
(2) Special manually-invoiced accounts including hydrant meters and Napa State Hospital.
(3) Unmetered uses and losses from activities such as main flushing, large main breaks, and Hennessey WTP de-sludging.

Table 5-5
Water Accounts By Customer Type 2005-2030

Customer Type	Number of Accounts					
	2005	2010	2015	2020	2025	2030
Single-Family Residential	21,110	22,187	23,307	24,470	25,073	25,720
Multi-Family Residential	1,393	1,464	1,538	1,614	1,654	1,697
Commercial	1,445	1,518	1,594	1,674	1,715	1,759
Industrial	2	2	2	3	3	3
Institutional/Government	242	255	268	281	288	295
Landscape Irrigation	254	267	281	295	302	310
Agricultural Irrigation[1]	16	17	18	19	19	20
Miscellaneous Accounts[2]	38	40	42	44	46	46
Total	24,500	25,750	27,050	28,400	29,100	29,850

(1) Interruptible-Surplus Agricultural Water Agreements with customers outside the City limits.
(2) Special manually-invoiced accounts including hydrant meters and Napa State Hospital.

UWMP 2000 had projected 25,737 total water accounts on the system by 2005. This overestimated the actual total by more than 1,200. This UWMP 2005 update corrects this and improves the reliability of future normal year demand data and number of accounts.

5.4 Sales to Other Agencies

The City of Napa does provide water to the Cities of American Canyon, St. Helena, and Calistoga, and the Town of Yountville. Aside from occasional emergency water for St. Helena, these are not retail sales. The agencies are wholesale customers who provide the source of supply and merely benefit from the City's treatment and transmission facilities. They are charged wholesale rates for this treat-and-wheel service. Because water supplied to American Canyon, Yountville, and Calistoga counts against those agencies' SWP Table A entitlements, *it does not impact City of Napa supplies and it is excluded from the retail demand totals in this chapter and the water service reliability analysis in Chapter 9*. By showing 2000-2004 data, Table 5-6 illustrates the amounts typically delivered to these other local agencies.

Table 5-6
Water Treated and Wheeled to Other Agencies

Agency	Annual Water Sent to Agency (AF)				
	2000	2001	2002	2003	2004
City of American Canyon	148	500	635	914	1,374
Town of Yountville	44	315	282	372	322
City of Calistoga	479	578	560	474	460
City of St. Helena	0	0	0	0	<1
Total	671	1,393	1,477	1,760	2,156

CHAPTER 6

WATER CONSERVATION

6.1 Memorandum of Understanding

Water conservation is an integral part of the City of Napa's long-term water management strategy and specific levels of conservation savings are built into future demand projections. Like most water agencies in California, the City instituted successful demand reduction measures during the extended drought of 1987-1992. Even after that crisis ended, the City made permanent several of those measures, including school education, public information, and an aggressive toilet replacement program. The developer-funded program to replace high-water-use pre-1992 toilets with ultra-low-flush toilets (ULFTs) has been the key factor in an approximate 4% reduction in per capita demand. The City is looking to achieve at least another 6% in permanent water conservation savings by 2020.

In the years since the UWMP 2000 update was filed, the City has further evaluated its overall water conservation program, including budgeting and staffing. In December 2002, the City joined the California Urban Water Conservation Council (CUWCC), a consensus-based partnership of urban water suppliers, public advocacy organizations, and other parties concerned with water supply issues. Formed in 1991 at the height of the 6-year drought, the CUWCC oversees the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) which sets forth Best Management Practices (BMPs) in water use efficiency.

When admitted to the CUWCC in 2002, the City became a signatory to the MOU, joining more than 170 other water suppliers across California. MOU signatories agree to make a "good faith effort" to implement all 14 BMPs. Each BMP has a specific implementation schedule and coverage requirement. Agencies file BMP progress reports directly on the CUWCC web site.

6.2 Best Management Practices

Section 10631(j) of the State Water Code states that:

(j) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirement of subdivisions (f) and (g).

As a CUWCC member, the City of Napa is using this provision in the Act to meet the Demand Management Measures (DMMs) requirements for this UWMP 2005 update. As required by DWR, the City has included copies of its BMP Activity Reports for calendar years 2003 and 2004 in Appendix C. These filed BMP Reports can also be accessed at the following web site:

http://bmp.cuwcc.org/bmp/read_only/list.lasso

Because the detailed BMP Reports in Appendix C quantify the City's conservation activities, expenditures, and in some cases annual water savings, only very brief summaries of each BMP are presented in this chapter:

BMP 1: Water Survey Programs for Single-Family and Multi-Family Residential Customers

After targeting extreme high water users in previous years, the City instituted a new Water-Wise Home Survey Program in December 2003. Marketed to all residential customers, the program includes a site visit by a Water Conservation Representative who checks leaks, plumbing fixture flow rates, and irrigation system performance. If warranted, customers are offered free low-flow showerheads, faucet aerators, toilet flappers, toilet replacement program information, and irrigation scheduling and maintenance tips. More than 120 surveys were completed in the first year of the program. The City is hiring a permanent staff member to help increase the number of surveys completed in order to meet the BMP coverage requirements in the MOU.

BMP 2: Residential Plumbing Retrofit

Distribution of low-flow showerheads, faucet aerators, and toilet flapper valves was initiated in the early 1990's. In 2003 and 2004 alone, more than 2,300 low-flow showerheads were distributed to single-family and multi-family customers. The City is considering a customer survey to demonstrate whether 75% of residential accounts are now fitted with low-flow showerheads. If so, then the City will have already met the coverage requirement for this BMP.

BMP 3: System Water Audits, Leak Detection and Repair

The City completes an annual prescreening audit of its distribution system to determine if metered sales plus other verifiable uses account for at least 90% of total supply into the system. If not, then a full-scale system audit is warranted. Since signing the MOU, the City has not been required to do a full audit. Unaccounted-for water has dropped below 8%. Aggressive meter, main, and plastic service replacement programs have contributed to maintaining low unaccounted-for totals. From 2001 to 2004, more than 20,000 feet of aging water mains were replaced, significantly reducing system leaks.

BMP 4: Metering with Commodity Rates

The system is fully metered. Excluding standby fire sprinkler services, all existing and new connections require meters and are billed by volume of use. The City mandates that projects with 5,000 square feet or more of landscaping have dedicated irrigation meters. The City will examine the feasibility of switching more large mixed-use accounts to dedicated irrigation meters.

BMP 5: Large Landscape Conservation Programs and Incentives

For 2003 and 2004 BMP reporting, the City used an "At Least As Effective As" option to meet the coverage requirement of this BMP. The City funded the installation of computer-based central irrigation systems controlling 25 City parks and 21 Napa Valley Unified School District (NVUSD) fields. Employing a weather station, ET controllers, and flow sensing equipment, the central control systems are expected to save 130-230 AF per year by fully optimizing irrigation schedules and addressing leaks.

In related educational activities, the City presents an annual Water-Wise Landscaping Workshop Series and has developed a CD-ROM *Water-Wise Gardening in the Napa Valley*. The City also mandates that new commercial development with more than 1,000 square feet of landscaping meet the City's Water Efficient Landscape Guidelines based upon AB 325.

BMP 6: High-Efficiency Washing Machine Rebate Programs

The City's Residential High-Efficiency Clothes Washer Rebate Program began in April 2004 to encourage the purchase of models that use up to 70% less water and energy than conventional machines. By the end of 2005, more than 800 customers will have received nearly $100,000 in rebate incentives. The City is on pace to exceed the new coverage goal adopted March 10, 2004 by the CUWCC.

BMP 7: Public Information Programs

The City routinely publicizes its water conservation offerings through water bill messages, press releases, and *The Reservoir* newsletter which premiered in 2003. Water conservation staff host displays at public events such as the Napa-Solano Home & Garden Show and are available to speak to community and business groups. The public is always encouraged to visit the Water Division building to pick up free conservation devices and brochures. Since 2003, the City has focused greatly on landscape conservation with two Water-Wise Demonstration Gardens and the CD-ROM discussed in BMP 5 above.

BMP 8: School Education Programs

City water conservation staff were instrumental in the formation of the Environmental Education Coalition of Napa County (EECNC). The EECNC Environmental Education Guide distributed to all area teachers lists field trips and classroom presentations offered by local agencies and non-profit organizations. The City offers an interactive water conservation presentation for elementary and middle school classrooms and hosts school groups at its Jamieson Canyon WTP. A *Water Week* Teaching Kit is also provided to interested teachers.

BMP 9: Conservation Programs for Commercial, Industrial, and Institutional (CII) Accounts

In March 2004, the City began participating in the LightWash Program, offering High-Efficiency Commercial Clothes Washer Rebates to laundromats and other eligible businesses. $11,000 of the originally budgeted $15,000 had been distributed by the end of 2005. More than 100 water-saving pre-rinse spray valves were installed at local restaurants in late 2005 as part of the CUWCC Rinse & Save Program. The City is planning to introduce a Water-Wise Business Survey Program, modeled after the existing program for residential customers (BMP 1).

BMP 9a: CII ULFT Water Savings

In this CUWCC 3-year interim program, the City achieved the highest level of CII toilet replacement among all the participating water agencies. In late 2001, the City opened up the developer-funded Toilet Retrofit Program described in BMP 14 to CII customers. Offices, hotels, restaurants, and schools jumped at the opportunity to replace older high-water-use toilets with ULFTs. More than 1,500 ULFTs were installed under the program by the end of 2004.

BMP 10: Wholesale Agency Assistance Programs *(This BMP is Not Applicable to City of Napa)*

BMP 11: Conservation Pricing

By employing a uniform volumetric rate structure with no fixed charges, the City meets the definition of conservation pricing in this BMP. Customers are billed based on the quantity of water consumed.

BMP 12: Conservation Coordinator

The Water Resources Specialist acts as the City's Conservation Coordinator and primary contact with the CUWCC. This is a full-time position with some additional duties other than conservation. The Water Resources Specialist holds a Level 1 Water Conservation Practitioner Certification from the California-Nevada section of the American Water Works Association and is assisted in BMP implementation by the City's Water Conservation Representative.

BMP 13: Water Waste Prohibition

Originally established with an ordinance in 1992, Napa Municipal Code Chapters 13.10 and 13.12 address prohibitions and limitations on water use during Moderate and Severe Water Shortages as declared by City Council. Attached in Appendix D, these chapters have been inoperative since 1993. A declaration by City Council would be required to reactivate them. The City is examining the feasibility of a new, permanent Water Waste Ordinance that addresses the specific prohibitions listed in BMP 13.

BMP 14: Residential ULFT Replacement Programs

Residential customers have participated in the City of Napa Toilet Retrofit Program since 1991. Attached in Appendix D, Chapter 13.09 of the Napa Municipal Code requires developers to offset the projected water demand of their new projects (e.g., hotels, housing subdivisions) by reducing demand elsewhere in the City. Since 1991, this water offset has been achieved through replacement of older high-water-use toilets with new ULFTs. The BMP Reporting web site calculates that the program has achieved a total net savings of 4,500 AF through 2004.

CHAPTER 7

WATER SHORTAGE CONTINGENCY PLANNING

7.1 Introduction

Water use efficiency can help stretch dry year supplies. By implementing the water conservation BMPs described in Chapter 6, the City is achieving permanent demand reductions that increase the likelihood of local reservoirs starting full at the onset of a drought. However, drought is a natural part of the California climate and water supply reductions are inevitable in an extreme single-dry year or an extended multiple-dry year period. Emergency situations often require a water supplier to implement additional temporary conservation measures that reduce demand quickly but last for the duration of the emergency only. The Act requires the UWMP to include a Water Shortage Contingency Plan that addresses these temporary conservation measures and other actions necessary to handle supply emergencies.

The City of Napa's Water Shortage Contingency Plan, originally completed in January 1992, is attached in Appendix E. In the event of a drought, the City would likely adopt a Resolution to Declare a Water Shortage Emergency, which would implement this Plan. Attachment "E" in Appendix E contains a sample ordinance. Updates and highlights of the Plan are incorporated in this chapter of UWMP 2005. Should the City substantially revise its Water Shortage Contingency Plan, the changes will be filed in a future update of the UWMP.

In the most recent test of the City's ability to address a severe water shortage, the City took actions designed to achieve a 20% reduction in consumption for the year 1991. The actual reduction in consumption for 1991 was just over 31%.

7.2 Three-Year Minimum Supply

The Act requires that the City estimate the minimum water supply available during the next three years based on the driest three-year historic sequence. For SWP supply, 1990-1992 represents the driest sequence and the DWR reliability study discussed in Section 4.2 uses 28%, 24%, and 28% Table A deliveries for those three single years. Applying those delivery percentages to the City's actual SWP entitlements for 2006-2008 and adding the local reservoir data from Table 4-5, Table 7-1 estimates minimum supplies for the next three years.

Table 7-1
Estimate of Minimum Supplies 2006-2008 (AF)

Source	2006	2007	2008
SWP Deliveries	3,948	3,444	4,088
Lake Hennessey	10,417	10,417	10,417
Milliken Reservoir	700	700	700
Reservoir Depletion	6,533	1,333	1,333
Total	21,598	15,894	16,538

Because SWP contractors have already been notified of a 65% Table A allocation for 2006, the data in Table 7-1 are very conservative. Also, City reservoirs are currently at storage capacity, so normal yields are expected in 2006. The City does not anticipate any problems meeting water demands for the next three years.

7.3 Stages of Action

In response to a water shortage emergency, the City of Napa has developed a 5-stage plan. The City's plan includes no action, and voluntary and mandatory conservation stages.

Table 7-2
Water Shortage Stages of Action

Stage of Action	Demand Reduction Goal	Type of Conservation Program
Stage 1	10% reduction	NO ACTION
Stage 2	15% reduction	VOLUNTARY
Stage 3	20% reduction	MANDATORY
Stage 4	35% reduction	MANDATORY
Stage 5	50% reduction	MANDATORY

The following PRIORITIES for use of available water have been established:

- HEALTH AND SAFETY - interior residential and fire fighting.
- CII - maintain jobs and economic base.
- EXISTING LANDSCAPING - primary consideration is to protect trees and shrubs.
- NEW DEMAND - projects without permits when a shortage is declared mitigate to a zero demand through the Toilet Retrofit Program.
- AGRICULTURAL – customers with Interruptible-Surplus Water Agreements. When there is a water shortage declared this agricultural use is immediately suspended.

Supply Shortage Triggering Levels

The City of Napa has a legal responsibility to provide for the health and safety needs of its water customers. The City also feels an obligation to help minimize the social and economic impact of water shortages by managing the available water supplies prudently. Supply shortage triggering levels are established to ensure that these policy statements are implemented. The City retains the right to review and change these triggering levels at any stage of any water shortage situation. It is the City's goal to provide the best possible use of its water resources while minimizing any negative effects a water shortage might have on its customers.

Stages of action may be triggered by a shortage in one source or a combination of sources, or by insufficient carryover storage and projected supplemental water to provide a certain percentage of normal supplies for the next two years. The specific criteria for triggering the City's stages of action are listed in Table 7-3.

Table 7-3
Water Supply Triggering Levels

Stage of Action	% Supply Shortage	Carryover Shortage
STAGE 1	up to 10% supply reduction	or insufficient carryover storage and projected supplemental water to provide for 90% of normal supplies for the next 2 years
STAGE 2	10-20% supply reduction	or insufficient carryover storage and projected supplemental water to provide for 75% of normal supplies for the next 2 years
STAGE 3	20-35% supply reduction	or insufficient carryover storage and projected supplemental water to provide for 60% of normal supplies for the next 2 years
STAGE 4	35-50% supply reduction	or insufficient carryover storage and projected supplemental water to provide for 50% of normal supplies for the next 2 years
STAGE 5	>50% supply reduction	

7.4 Prohibitions, Penalties, and Consumption Reduction

During the last major drought to affect Napa (1987-1992), the City adopted Ordinance No. 4277, which prohibits specific acts of water waste. It is included in Appendix E as Attachment "C". Ordinance No. 4277 was an urgency ordinance addressing the emergency water shortage situation that occurred in 1991. The City eventually replaced the ordinance with Chapters 13.10 and 13.12 of the Napa Municipal Code. These chapters are attached in Appendix D. They are currently inoperative but would be reactivated by City Council in the event of a declared shortage.

Chapter 13.10 applies to a Moderate Water Shortage and establishes penalties and civil fines for specific acts of water waste. It includes potential restrictions on the amount of water that may be used by a single-family residence, with penalties applied to customers exceeding the amount. Among other regulations, it contains prohibitions on: operation of decorative fountains where water is not recirculated; use of hoses without shut-off nozzles; hosing down pavement and driveways; draining and filling of swimming pools; withdrawal of water from hydrants except for fire fighting; serving water to restaurant patrons except on request; and daytime watering of landscapes. Fines for violations range from $50 to $2,500.

Chapter 13.12 identifies more far-reaching restrictions and limitations on water use during a Severe Water Shortage of Stage 3 or greater. It includes: allocations of water for individual customers at varying percentages of historical usage; a requirement for the City's 50 largest users to submit a water conservation plan; and potential establishment of a special block rate structure to address drought-related water purchase and administration expenses. In addition, a wide range of prohibitions intended to minimize water waste are set forth, with a similar range of penalties as in Chapter 13.10.

Consumption Limits

To reduce short-term demand, an urban water supplier may use any type of consumption limit in its Water Shortage Contingency Plan that is appropriate for its area. Examples of consumption limits that may be used include, but are not limited to, percentage reductions in water

allotments, per capita allocations, an increasing block rate schedule for high usage of water with incentives for conservation, or restrictions on specific uses.

The City has established the following allocation methods for each customer type.

Single Family Residential	Winter/Summer - % Reduction w/Min/Max
Multi-Family Residential	Winter/Summer - % Reduction
CII	Winter/Summer - % Reduction
Landscape Irrigation	% Reduction
New Demand	Assigned Rationed Allocation
Agricultural	Termination of Water Service

The specific reductions at each stage and for each customer type are presented in Table 7-4.

Table 7-4
Annual Consumption Limits (AF) by Stage

STAGE 1	0-10% reduction in supply does not require any reductions by customers. The City will publicize a Water Shortage Awareness Program.					
STAGES 2-5	Residential	CII	Landscape	Agricultural	TOTAL	TOTAL % Demand Reduction
Normal Demand	10,000	3,000	800	200	14,000	0.0%
Stage 2 - Voluntary	8,500	2,550	680	0	11,730	16.2%
Stage 3 - Mandatory	8,000	2,400	560	0	10,960	21.7%
Stage 4 - Mandatory	6,500	1,950	440	0	8,890	36.5%
Stage 5 - Mandatory	5,000	1,500	320	0	6,820	51.3%

The allocation methods are defined:

Winter/Summer % Reduction with a Minimum/Maximum - A % reduction of the winter historical usage as a baseline allocation plus a greater % reduction of the summer historical usage that is in excess of the winter baseline. Additionally, single-family units are not rationed if their historical usage falls below a certain amount and are not allowed more water on their allocation even if their historical usage exceeds a certain amount. These amounts are determined by the various stages of rationing.

% Reduction - Is a straight % reduction of the customer's historical consumption.

Assigned Rationed Allocation - When an account does not have any previous history of water usage, an allocation is assigned to that account based on similar type usage or an area average of similar type accounts.

Termination of Water Service - Some of the City's water accounts are on special contracts (primarily interruptible agricultural agreements) where the City only supplies water when surplus water is available. The water service to these accounts is suspended during droughts.

The individual customer allocations will be based on a 4-year base period excluding any consumption history under mandatory rationing. This will give the City a more accurate view of

the usual water needs of each account and provides additional flexibility in determining allocations and reviewing appeals.

The Water Division General Manager shall classify each customer's allocation according to the methods described in the attachments to the Water Shortage Contingency Plan. The allocations shall reflect seasonal usage. Each customer shall be notified of his or her allocation in their water bill and the effective date of the water shortage emergency. New customers will be notified by mail after they have signed up for water service and will receive their water allocation with their first water bill. In the event of a disaster, prior notification may not be possible, and notification will be provided by other means. Any customer may appeal their classification on the basis of use or their allocation on the basis of incorrect calculations or use of non-current information. All appeals will be subject to a review and verification process before a change in an allocation is granted.

7.5 Water Use Monitoring During Shortages

Normal Monitoring Procedure

In normal water supply conditions, production figures are recorded daily. Totals are reported daily to the Water Treatment Facility Supervisor. Totals are reported weekly to the Water Division General Manager and incorporated into the water supply report.

Stage 1, 2, and 3 Water Shortages

During a Stage 1, 2, or 3 water shortage, daily production figures are reported to the Supervisor. The Supervisor compares the weekly production to the target weekly production to verify that the demand reduction goal is being met. Weekly reports are forwarded to the Water Division General Manager. Monthly reports are sent to the City Council. If reduction goals are not met, the Water Division General Manager will notify the City Council so that corrective action can be taken.

Stage 4 and 5 Water Shortages

During a Stage 4 or 5 water shortage, the procedure listed above will be followed, with the addition of a daily production report to the Water Division General Manager.

7.6 Revenue Impacts

Water Division revenue is primarily based on water sales, which results in variable income with mostly fixed expenses. Drought is the biggest potential issue related to collecting revenues for the Water Enterprise Fund. The current rate structure adopted by City Council is a uniform quantity charge. There are no fixed charges, so customers pay only for water that they use. In a drought situation when customers are asked or mandated to reduce consumption, the decreased sales could significantly reduce revenue in a given year or period of years. To deal with this possibility, the Water Division has a Revenue Stabilization Reserve Fund to help with revenue shortfalls during periods of low water sales. The idea behind this fund is to have a prudent reserve that may keep the City from having to raise water rates to cover operating expenses in a prolonged drought situation.

The City's most recent Water Rate Study was completed in 2004, and new rates were adopted that October, retaining the uniform quantity charge. The rates are set to increase annually to

fund capital improvement projects needed to maintain and improve the City's water system facilities, while also allowing build-up of the Revenue Stabilization Reserve Fund for the water shortage situations described in this chapter.

7.7 Catastrophic Supply Interruption Plan

In accordance with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002, the City of Napa has prepared an Emergency Response Plan (ERP). This document was most recently updated in February 2005. It serves as a resource for City personnel in preparing for, and responding to, a variety of potential large-scale emergencies involving the City's water system. Due to the confidential nature of the ERP, the document is not included with this UWMP, but some key provisions are discussed below.

The City's ERP contains specific action plans to address major events that could cause a catastrophic interruption of the City's water supply. The threats considered include:

- Earthquakes
- Floods
- Waterborne Diseases
- Vandalism
- Terrorism
- Backflow Conditions
- Construction Accidents
- Chemical Spills
- Power Outages
- Fires

The City is in a highly active seismic zone and an earthquake is perhaps the most likely event to significantly impact the water system infrastructure. For this or any other significant disaster, the City uses the Standardized Emergency Management System (SEMS) to allow rapid and effective coordination at the field level. In a major earthquake event, all Water Division employees fall under the Public Works Department's direction, the Operations section as defined by SEMS. The ERP includes these chain-of-command details for incidents, along with mutual aid agreements, emergency resources, emergency water supply calculations, and public notification procedures.

In regard to terrorism, the City has completed a Vulnerability Assessment and has implemented numerous improvements to help ensure the safety of the City's water customers.

The Water Division has developed a redundant system in the event of a disaster. The main points of this redundant system are:

1. The City has two major treatment plants, each capable of producing more than 12 MGD.
2. Each WTP has its own auxiliary power supply.
3. Each WTP has its own raw water source.
4. A distance of more than 20 miles separates the two plants, which lessens the likelihood that a disaster will affect both plants at the same time.
5. Both WTPs were designed with redundant systems so that should one process component fail, there will always be a backup available.

In the extremely unlikely event that the City loses all of its sources at once, the system's tank storage of 28 million gallons can help the City weather the emergency. The City's best security in an extreme emergency may be the ability to deliver raw water to town from both Lake Hennessey and Milliken Reservoir. That allows the City to provide water for fire protection even if the pipelines have numerous leaks. The raw water would also be available for human consumption as long it were boiled or treated with iodine.

With some events, it could be necessary for the City to use an emergency source of supply to maintain system pressure. The City has intertie connections with the Cities of American Canyon, St. Helena, and Calistoga, and the Town of Yountville. American Canyon would be capable of supplying Napa with approximately 4 MGD for a limited time.

Overall, the ERP points out the flexible design of the water system and the City's ability to minimize service disruptions in the worst of emergencies. For all conceivable emergencies, a specific plan is in place to rapidly restore water service, ensure water for fire fighting, and minimize negative impacts on public health and safety.

CHAPTER 8

RECYCLED WATER

8.1 Coordination

Recycled water is wastewater that is treated to the appropriate level to be approved by the State DHS for use as outdoor irrigation water. Use of recycled water is typically targeted at very large irrigation users such as golf courses, parks, and commercial businesses. The City of Napa does not produce or distribute recycled water. In the City's water service area, recycled water treatment and distribution is managed by the Napa Sanitation District (NSD). Wastewater from Napa and surrounding unincorporated areas is treated and recycled at the NSD Soscol Water Recycling Facility (WRF).

In 1998, the City and NSD entered into a 20-year agreement that permits NSD to solicit and provide recycled water service within a specified portion of the City's water service area. A copy of the agreement is attached as Appendix F. The agreement defines the recycled service area as lands east of the Napa River, south of Imola Avenue, west of Highway 221, and north of American Canyon. Generally, this means NSD recycled water can be made available to Napa State Hospital, Stanly Ranch, Napa Valley Corporate Park, South Napa Marketplace, and other nearby sites. The agreement includes a "make whole" calculation to ensure that City water revenues are not adversely affected by existing customers converting to recycled water. NSD also agreed to furnish up to 50 AF per year of recycled water to Kennedy Park and Napa Valley College at no cost.

In 2003, Napa Municipal Golf Course became the first City customer to switch. But by 2005, four customers had converted from City water to NSD recycled water for all or part of their irrigation needs:

- Napa Municipal Golf Course
- Dey Labs
- Chapel of the Chimes Cemetery
- Napa Valley College

In addition, several new developments in the Napa Valley Corporate Park connected to the NSD recycled pipeline. These are customers that would have otherwise connected to the City's potable water system.

These conversions to recycled water had the effect of reducing City water demand by 118 AF in 2003 and 272 AF in 2004. The 2050 Study and the demand projections in UWMP 2005 attempt to account for potential conversions to NSD recycled water in the area covered by the 1998 agreement.

8.2 Wastewater Treatment

Soscol WRF is located at the most southern part of Napa County. Five pumping stations feed into the major collection lines: Stonecrest, North Napa, Edmondson, Riverpark, and West Napa.

Prior to entering the recycling process, preliminary and primary treatment are used to remove solids and organic matter from the wastewater. Large oxidation ponds promote the growth of algae to oxidize the organic matter in the wastewater. The recycling process begins with the withdrawal of the algae-laden effluent from the oxidation ponds.

- Flocculating Clarifiers: Up to 150 parts per million of total suspended solids enter the recycling process. Algae removal begins in the flocculating clarifiers. Here polymer is added to cause some of the solids to clump together and settle to the basin bottom where they are removed.
- Secondary Effluent Pump Station: Clarified oxidation pond effluent flows to the secondary effluent pump station where it is lifted to the flocculation basins. Three 100-hp pumps, each capable of moving 10 MGD, are used.
- Flocculation Basins: Prior to filtration, more polymers are added and the water is gently stirred in three consecutive flocculation basins. This conditions the remaining solids so they can then be readily removed through filtration.
- Continuous Backwash Filters: In the filters, water passes through about 6 feet of sand, removing the remaining algae solids. To keep the filters clean, air is used to continuously lift, agitate, and wash the sand. This continuous backwash system, which is the largest of its kind in operation in the U.S., does not require shutdown for cleaning.
- Disinfectant Rapid Mixing: Sodium hypochlorite disinfectant is added to the filtered water to destroy harmful bacteria. This liquid chemical is a stronger version of common laundry bleach. Rapid mixing ensures that the chemical is fully and efficiently blended with the filtered water.
- Chlorine Contact Basins: The chlorinated water is allowed to sit for two hours in chlorine contact basins to ensure maximum bacteria reduction. Because chlorine can be harmful to plants and aquatic life, residual chlorine can be reduced or removed by adding sodium bisulfite for dechlorination.
- Recycled Water Storage Reservoirs: Tertiary-treated recycled water is stored in reservoirs for a short time prior to distribution.
- Recycled Water Pump Station: The recycled water pump station delivers the water to customers throughout the southern Napa Valley. The pump station uses three 600-hp pumps to distribute the water at pressure of up to 150 psi.

NSD recycled water is disinfected tertiary quality, the highest quality recognized under DHS Title 22 requirements.

Prior to the conversion of the first City water customer in 2003, the major users of NSD recycled water consisted of a few farming properties, a local golf course, a vineyard, and a some businesses in the southern end of the County. For illustration, Table 8-1 shows the volume of wastewater treated at Soscol WRF back in 2000 while Table 8-2 shows recycled water use that same year.

Table 8-1
NSD Wastewater Collection in 2000

Stonecrest	96 MG
North Napa	1,766 MG
Edmondson	13 MG
Riverpark	25 MG
West Napa	953 MG
Total Wastewater Collected	**2,853 MG**

Table 8-2
NSD Recycled Water Usage in 2000

Somky Ranch	175 MG
Jamieson Canyon Ranch	201 MG
Chardonnay Golf Course	195 MG
Giles Vineyard	0.5 MG
Kohnan	2.5 MG
CDI	3.9 MG
Trucked Water	0.1 MG
Total Recycled Water	**578 MG**

The amount of wastewater recycled back in 2000 was under 1,800 AF (578 MG). With the expansion of pipelines to the north and the new customers added since then, NSD recycled water distribution exceeded 2,100 AF by 2004. As mentioned earlier, 272 AF of that total was used by former City water customers.

8.3 Future Recycled Water Use

During the preparation of UWMP 2005, NSD released a draft version of its *Strategic Plan for Recycled Water Use in the Year 2020*. The Executive Summary of that document is attached as Appendix G. The potential for local recycled water production was estimated to be 4,540 AF per year by 2020 using existing storage and 9,800 AF per year if additional storage were made available. Seven strategies for future recycled water optimization were proposed and two were recommended for consideration by the NSD Board. The two recommended strategies involve from 3,590 AF to 4,540 AF being delivered to Napa-area customers in 2020. Some of the new prospective recycled water customers would be current City water customers, including a few outside the scope of the 1998 City/NSD agreement.

Realizing the value of recycled water as an important resource for the region's future, the City is cooperating with NSD in evaluating these developing plans while examining the effects of potential revenue loss from its existing customers. In 2005, the City joined with NSD and other local agencies to form the Napa-Berryessa Regional Water Management Group. The Group has applied for Prop 50 grant funds for several recycled water projects.

Once finalized, the NSD *Strategic Plan for Recycled Water Use in the Year 2020* will become the primary document detailing the Napa area's future recycled water potential. While the

highlights are summarized in Appendix G, the full document and its current status can be accessed at the following web site:

http://www.recycledwaterstrategicplan.com/reports_docs.htm

Should the NSD Board finalize or revise this Strategic Plan and have a significant impact on City of Napa water management plans, the City will file an update of this UWMP with the State.

As discussed under "Recycled Water Adjustments" in Section 5.2, UWMP 2005 assumes a net City system demand reduction of 266 AF per year through 2030 arising from the existing 1998 agreement.

CHAPTER 9

WATER SERVICE RELIABILITY: SUPPLY VS. DEMAND

9.1 Normal Year Scenario

As required by the Act, this chapter analyzes the reliability of the City's water service by comparing supply and demand for future normal, single-dry, and multiple-dry year scenarios. Using the data presented earlier in Chapters 4 and 5, Table 9-1 projects normal year supply and demand comparisons to 2030.

Table 9-1
Projected Supply and Demand: Normal Years

	Projected Annual Water (AF)				
	2010	2015	2020	2025	2030
Total Supply	29,676	30,892	33,172	33,248	33,248
Total Demand	16,395	17,489	18,798	19,243	19,699
Difference (Supply minus Demand)	+13,281	+13,403	+14,374	+14,005	+13,549
% Difference (surplus or shortfall)	+81%	+77%	+76%	+73%	+69%

Surpluses ranging from 69% to 81% are projected in normal years through 2030.

9.2 Single-Dry Year Scenario

Table 9-2 projects single-dry year supply and demand comparisons through 2030. As in the 2050 Study, it is assumed that demand in a single-dry year is 85% of normal year demand. This 15% demand reduction would result from public notification of drought conditions and Stage 2 voluntary actions in the Water Shortage Contingency Plan. The table may overestimate true single-dry year demands as the City achieved a 31% demand reduction in the most recent critical single-dry year of 1991.

Table 9-2
Projected Supply and Demand: Single-Dry Years

	Projected Annual Water (AF)				
	2010	2015	2020	2025	2030
Total Supply	15,020	15,340	15,940	15,960	15,960
Total Demand	13,936	14,866	15,978	16,357	16,744
Difference (Supply minus Demand)	+1,084	+474	-38	-397	-784
% Difference (surplus or shortfall)	+8%	+3%	-0.2%	-2%	-5%

With the assumptions used in the 2050 Study and UWMP 2005, the City would experience water shortages in single-dry years occurring in 2020 and beyond. As noted earlier, many of these assumptions have been very conservative for planning purposes, such as the ABAG population in the RUL, the starting per capita demand of 180 gpcd, and the 10% unaccounted-for water. More favorable numbers in any of these categories could almost eliminate these projected shortfalls of 0.2% to 5%. Also, long-term BMP implementation and the additional

recycled water users proposed in the draft NSD *Strategic Plan* could reduce City demand enough to erase these deficits. In the worst case and if no imported dry year supplies were obtained, Stage 3 actions in the Water Shortage Contingency Plan could be needed.

9.3 Multiple-Dry Year Scenario

Table 9-3 projects multiple-dry year supply and demand comparisons through 2030. As in the 2050 Study, it is assumed that demand in a multiple-dry year is 85% of normal year demand. This 15% demand reduction would result from public notification of drought conditions and Stage 2 voluntary actions in the Water Shortage Contingency Plan.

Table 9-3
Projected Supply and Demand: Multiple-Dry Years

	Projected Annual Water (AF)				
	2010	**2015**	**2020**	**2025**	**2030**
Total Supply	18,490	19,130	20,330	20,370	20,370
Total Demand	13,936	14,866	15,978	16,357	16,744
Difference (Supply minus Demand)	+4,554	+4,264	+4,352	+4,013	+3,626
% Difference (surplus or shortfall)	+33%	+29%	+27%	+25%	+22%

Surpluses ranging from 22% to 33% are projected in multiple-dry years through 2030. These supply data represent the final years of extended multiple-dry year periods when little reservoir depletion is available. Therefore, no shortfalls are expected at any point during multiple-dry year periods occurring through 2030.

The City projects strong water service reliability for the next 25 years. No shortfalls are expected for normal years or multiple-dry year periods through 2030. No shortfalls are expected in any single-dry years until 2020, when very small deficits begin. As described in Section 9.2, these deficits may be alleviated through long-term water conservation BMPs or additional recycled water use.